Kansas Agricultural Experiment Station Research Reports

Volume 2
Issue 7 *Southwest Research-Extension Center Reports*

Article 23

January 2016

Weed Control with Single or Sequential Herbicide Applications in Acetolactase Synthase-Tolerant Grain Sorghum

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Recommended Citation

Currie, R. and Geier, P. (2016) "Weed Control with Single or Sequential Herbicide Applications in Acetolactase Synthase-Tolerant Grain Sorghum," *Kansas Agricultural Experiment Station Research Reports*: Vol. 2: Iss. 7. https://doi.org/10.4148/2378-5977.1268

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Abstract

Palmer amaranth control was best when Resolve (rimsulfuron) plus Harmony GT (thifensulfuron) and Abundit Extra (glyphosate) were applied 15 days preplant followed by Zest (nicosulfuron) and atrazine postemergence, or by Zest plus atrazine alone postemergence. Palmer amaranth control was less than 80% with all other herbicide treatments. Preemergence herbicides alone provided less than 60% green foxtail control at 53 days after postemergence applications, and Zest plus atrazine alone postemergence controlled green foxtail 70%. Sequential applications of preemergence and postemergence herbicides were needed to provide the best green foxtail control. The relatively low weed control provided by these treatments may be partially explained by excessive precipitation and irrigation during the study.

Keywords

grain sorghum, acetolactase synthase-tolerant grain sorghum, weed control, Palmer amaranth, puncturevine, green foxtail, Resolve, Rimsulfuron, Harmony GT, Thifensulfuron, Abundit Extra, Glyphosate, Zest, Nicosulfuron, atrazine

K-STATE Research and Extension

2016 SWREC Agricultural Research

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R. Currie and P. Geier

Summary

Palmer amaranth control was best when Resolve (rimsulfuron) plus Harmony GT (thifensulfuron) and Abundit Extra (glyphosate) were applied 15 days preplant followed by Zest (nicosulfuron) and atrazine postemergence, or by Zest plus atrazine alone postemergence. Palmer amaranth control was less than 80% with all other herbicide treatments. Preemergence herbicides alone provided less than 60% green foxtail control at 53 days after postemergence applications, and Zest plus atrazine alone postemergence controlled green foxtail 70%. Sequential applications of preemergence and postemergence herbicides were needed to provide the best green foxtail control. The relatively low weed control provided by these treatments may be partially explained by excessive precipitation and irrigation during the study.

Introduction

Rimsulfuron and nicosulfuron have long provided excellent control of sorghum species weeds in corn. However until the advent of hybrids resistant to these herbicides, they could not be used in grain sorghum. A 10-year partnership between Kansas State University and DuPont Crop Protection with support from the Kansas Grain Sorghum Commission, the Sorghum Checkoff, and National Sorghum Producers will now allow these tools to be used. Inzen® brand sorghum will have resistance to nicosulfuron and rimsulfuron, allowing the in-crop use of the herbicide Zest. Therefore, the objective was to study various tankmixes of this product to produce optimum weed control in sorghum.

Procedures

An experiment in 2015 at the Kansas State University Southwest Research-Extension Center near Garden City, KS, evaluated the crop tolerance and efficacy of Zest plus atrazine postemergence application timings in acetolactase synthase-tolerant grain sorghum. Herbicides were applied preemergence (PRE) alone, mid-postemergence (MPOST) following 15 day preplant (15 DPP) or PRE treatments, postemergence (POST) following PRE treatments, or POST alone (Table 1). All herbicides were applied using a tractor-mounted or backpack-type CO_2 pressurized sprayer delivering 20 gpa at 3 mph and 27 to 30 psi. Soil was a Ulysses silt loam with organic matter of 1.4%, pH of 8.0, and cation exchange capacity of 18.4. Plots were 10 by 35 feet, arranged in a randomized complete block with four replications. Visual weed control was determined

September 15, 2015, which was 53 days after POST application. Grain yields were not determined.

Results and Discussion

It has become standard practice to apply a three-pass program to provide acceptable weed control in sorghum: a foundation treatment in March followed by an early preplant or at-planting time treatment followed by some postemergence treatment. In some years the March treatment alone can provide a level of control that makes evaluation of the subsequent early preplant or post programs difficult. Therefore, these March treatments were not applied. Because early season subsoil moisture was limited, several early season irrigations were applied that were followed by exceptional levels of rainfall. Rainfall was 9.6 inches during first several weeks of the growing season, and irrigation totaled 3.0 inches during this timeframe. This tested all tankmixes to the breaking point in this test and in all other sorghum tests in 2015. Results here are atypical to results seen in previous tests during the last 9 years. Palmer amaranth control was best (83 to 88%) when Resolve plus Harmony GT and Abundit Extra were applied 15 DPP followed by Zest and atrazine POST, or by Zest plus atrazine alone POST (Table 2). Palmer amaranth control was less than 80% with all other herbicide treatments. All herbicides except Cinch ATZ (*S*-metolachlor + atrazine) alone PRE (60%) controlled puncturevine 73 to 78%. Preemergence herbicides alone provided less than 60% green foxtail control at 53 days after POST applications, and Zest plus atrazine alone POST controlled green foxtail 70%. Sequential applications of herbicides provided the best green foxtail control.

Table 1. Application information.

Application timing	15 days preplant	Preemergence	Mid postemergence	Late postemergence
Application date	June 3, 2015	June 18, 2015	July 15, 2015	July 24, 2015
Air temperature (°F)	90	76	84	80
Relative humidity (%)	33	55	46	60
Soil temperature (°F)	76	77	77	75
Wind speed (mph)	2 to 3	5 to 6	2 to 3	3 to 4
Wind direction	South	Northwest	Southwest	South
Soil moisture	Good	Fair	Good	Good

Table 2. Weed control with single or sequential herbicide applications in acetolactase synthase-tolerant grain sorghum.

			53 days after POST application		
Treatment[a]	Rate	Timing[b]	Palmer amaranth	Puncturevine	Green foxtail
			% visual		
Resolve	1.8 oz	15 DPP	83	75	85
Harmony	0.9 oz	15 DPP			
GT	32 oz	15 DPP			
Abundit	12 oz	MPOST			
Extra	24 oz	MPOST			
Zest	1 %	MPOST			
Atrazine	2 lb	MPOST			
COC					
AMS					
Resolve	1.0 oz	PRE	78	78	55
Harmony	0.5 oz	PRE			
GT	51 oz	PRE			
Cinch ATZ					
Cinch ATZ	51 oz	PRE	70	60	53
Resolve	1.0 oz	PRE	73	75	80
Harmony	0.5 oz	PRE			
GT	51 oz	PRE			
Cinch ATZ	12 oz	MPOST			
Zest	24 oz	MPOST			
Atrazine	1 %	MPOST			
COC	2 lb	MPOST			
AMS					
Cinch ATZ	51 oz	PRE	78	73	78
Zest	12 oz	POST			
Atrazine	24 oz	POST			
COC	1 %	POST			
AMS	2 lb	POST			
Zest	12 oz	POST	88	73	70
Atrazine	24 oz	POST			
COC	1 %	POST			
AMS	2 lb	POST			
Untreated			0	0	0
LSD (0.05)			9.7	9.3	11.0

[a] All plots received Abundit Extra at 32 oz/a preemergence. COC is crop oil concentrate and AMS is ammonium sulfate.

[b] 15 DPP is 15 days preplant, PRE is preemergence, MPOST is mid-postemergence, and POST is postemergence.

Figure 1. Untreated control.

Figure 2. Resolve 1.8 oz + Harmony GT 0.9 oz + Abundit Extra 32 oz 15 days preplant followed by Zest 12 oz + atrazine 24 oz + COC 1% + AMS 2 lb mid-postemergence, 18 days after mid-postemergence application.

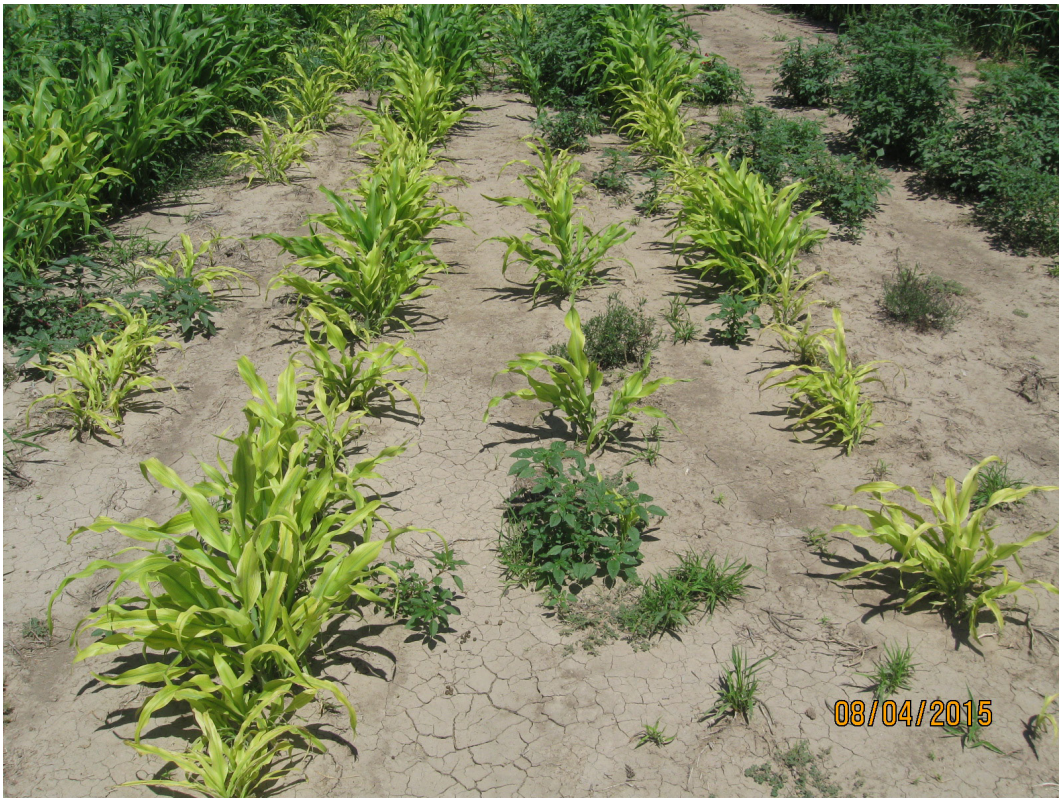

Figure 3. Resolve 1 oz + Harmony GT 0.5 oz + Cinch ATZ 51 oz preemergence, 47 days after preemergence application.

Figure 4. Cinch ATZ 51 oz preemergence, 47 days after preemergence application.